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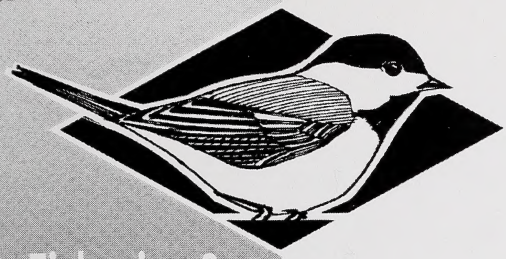

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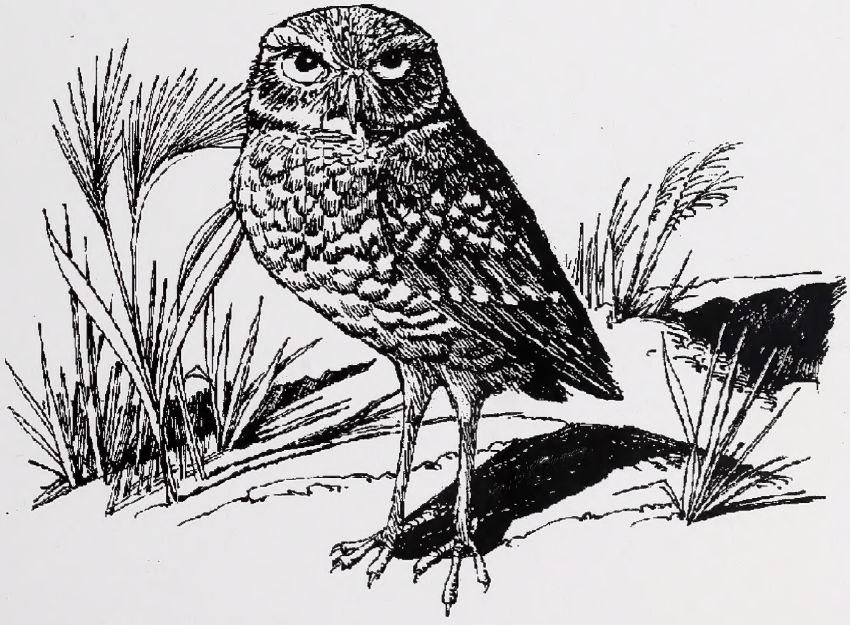

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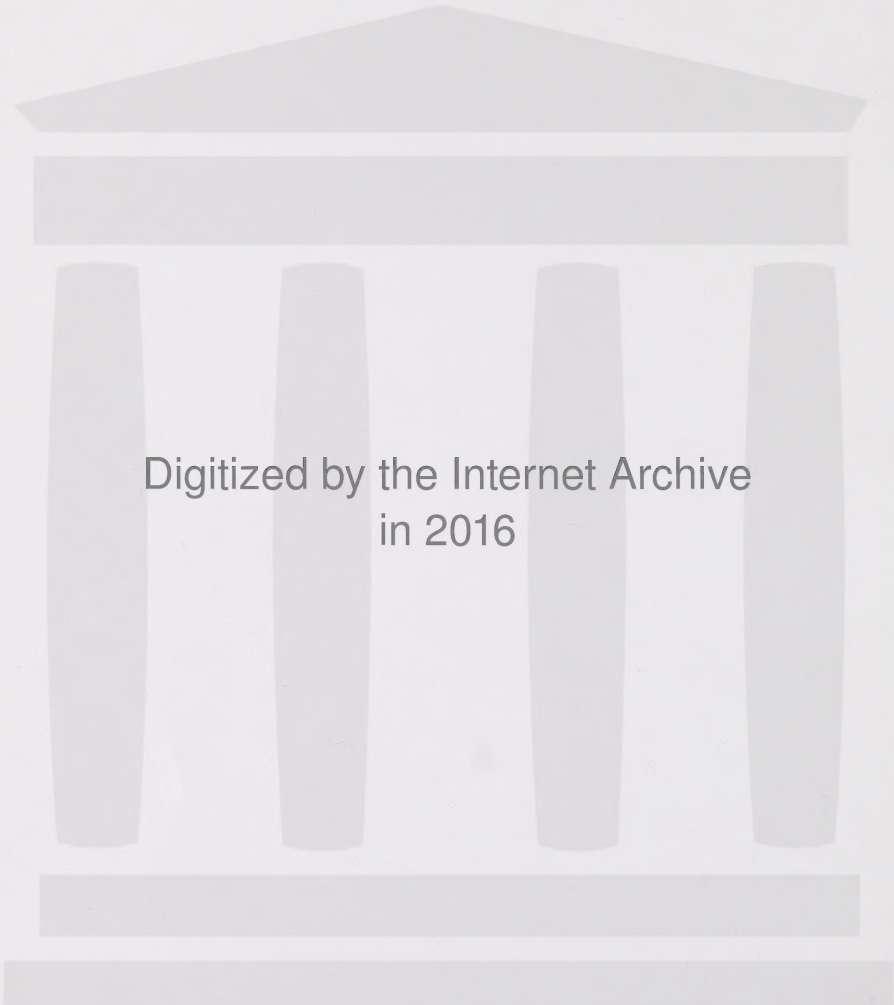
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2001 Burrowing Owl Trend Block Survey and Monitoring, Brooks and Hanna Areas

D. Scobie

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Abstract

Surveys were conducted in the Brooks (K-blocks) and Hanna (H-blocks) areas during June 18 - 27, 2001. Eight (8) burrowing owl nest sites and 2 single owls were found in the K-blocks and no owls were found in the H-blocks. Productivity monitoring was undertaken in the K-Blocks between July 10 – 24 with 5.3 young per successful nest (n=6). **Specific location details for all nests found have been removed from this document, as this report is for public distribution.**

Access was denied to 75 ¼ sections in H-blocks mainly because of concern of the upcoming federal Species At Risk Act. This is the second year that access has been denied on a portion of the Hanna Blocks and highlights the need for personal contact with all landholders in the K-block and H-blocks.

Acknowledgements

Appreciation is extended to trend block surveyors Christina Devlin, Jennifer Hemsing, Corey Scobie, and Rob Sissons (Avocet Environmental Inc.). Reg Russell (Alberta Sustainable Resource Development - Fish and Wildlife Division, Brooks) and Darcey Shyry participated in the trend block surveys and also assisted with the productivity monitoring. Arlen Todd (Alberta Sustainable Resource Development) and Reg Russell provided editorial assistance. The Alberta Species at Risk Program (Alberta Sustainable Resource Development) provided funding.

A special note of appreciation goes to the Eastern Irrigation District and all private landholders in Special Areas for allowing the continuation of surveys.

Disclaimer

The opinions and recommendations expressed are those of the author, and not necessarily those of Alberta Sustainable Resource Development.

INTRODUCTION

The burrowing owl (*Athene cunicularia)* is a small bird of prey about the size of a Richardson's ground squirrel (*Spermophilus richarsonii).* Burrowing owls are unique in that they use the abandoned burrows of ground squirrels (*Spermophilus* spp.), badgers (*Taxidea taxus)* and prairie dogs (*Cynomys* spp.) for nesting, roosting and caching food. The species is found in well-drained grasslands, prairies, steppes, deserts, and agricultural areas in the Americas from Canada to Argentina and Chile (Haug et al 1993). In Canada, burrowing owls were formerly found widely, but often sparsely, distributed across grassland regions of the prairie provinces, and in the interior of British Columbia (Wedgwood 1978). Canadian populations are migratory. Birds arrive in mid-April or early May and begin nesting shortly afterwards. They migrate southward to wintering areas in the southern United States or Mexico (James 1992, G. Holroyd, pers. comm.) in late September and early October.

Burrowing owl populations declined dramatically over much of western North America over the last half of the 20th century. Wellicome (1997) discusses direct and indirect limiting factors attributed to human activities. These limiting factors (in no order of ranking) are habitat loss and degradation, mortality on migration or wintering grounds, pesticides, predation, collision with vehicles and shooting.

The burrowing owl is ranked 'G4' in North America with widespread distribution, relatively common in appropriate habitat in some areas but habitat alteration and other factors are causing population declines in many areas (Nature Serve 2001). It is considered a 'species of special concern' in most northern Great Plains states (Haug et al 1993, Martell 1991, Marti and Marks 1989). Burrowing owls are 'endangered' in Canada (a species facing imminent extirpation or extinction) by the Committee on the Status of Endangered Wildlife in Canada (2001) and designated as 'threatened' in Alberta (Alberta Sustainable Resource Development 2001).

Avocet Environmental Inc. was successful in acquiring the bid contract "Burrowing Owl Survey - K and H Blocks" in the County of Newell and Special Areas, Alberta, Canada. These surveys first started in 1991 and focus on locating burrowing owl sites within 269 permanent quarter section plots, following a standardized survey protocol. The H-Blocks were selected where owls once occupied whereas the K-Blocks were randomly selected. Other species of national and/or provincial concern were recorded as incidental observations. Monitoring of these permanent trend blocks allows researchers to compare population trends using a standardized survey protocol (Shyry 1999). Shyry (1999) provides a detailed description, rationale and summary of five years of these surveys from which many of the figures and tables presented in this report were derived.

Avocet Environmental Inc. conducted the trend block survey for Alberta Sustainable Resource Development - Fish and Wildlife Division under the direction of Reg Russell, Alberta Sustainable Resource Development - Fish and Wildlife Division, Brooks, Alberta.

STUDY AREAS

KININVIE

This study area is referred to as the K-Blocks (the terms Brooks and Kininvie are used interchangeably) (See Figure 1) and is comprised of 160-quarter sections in 10 regularly shaped

blocks located in the County of Newell, Alberta. The K-Blocks are situated approximately 35 km south and east of Brooks and are bounded by Highway 544 to the north and to the south by Highway 524. Habitat within the area is comprised primarily of native prairie interspersed with tame (i.e. crested wheat grass (*Agropyron cristatum*)) rangeland.

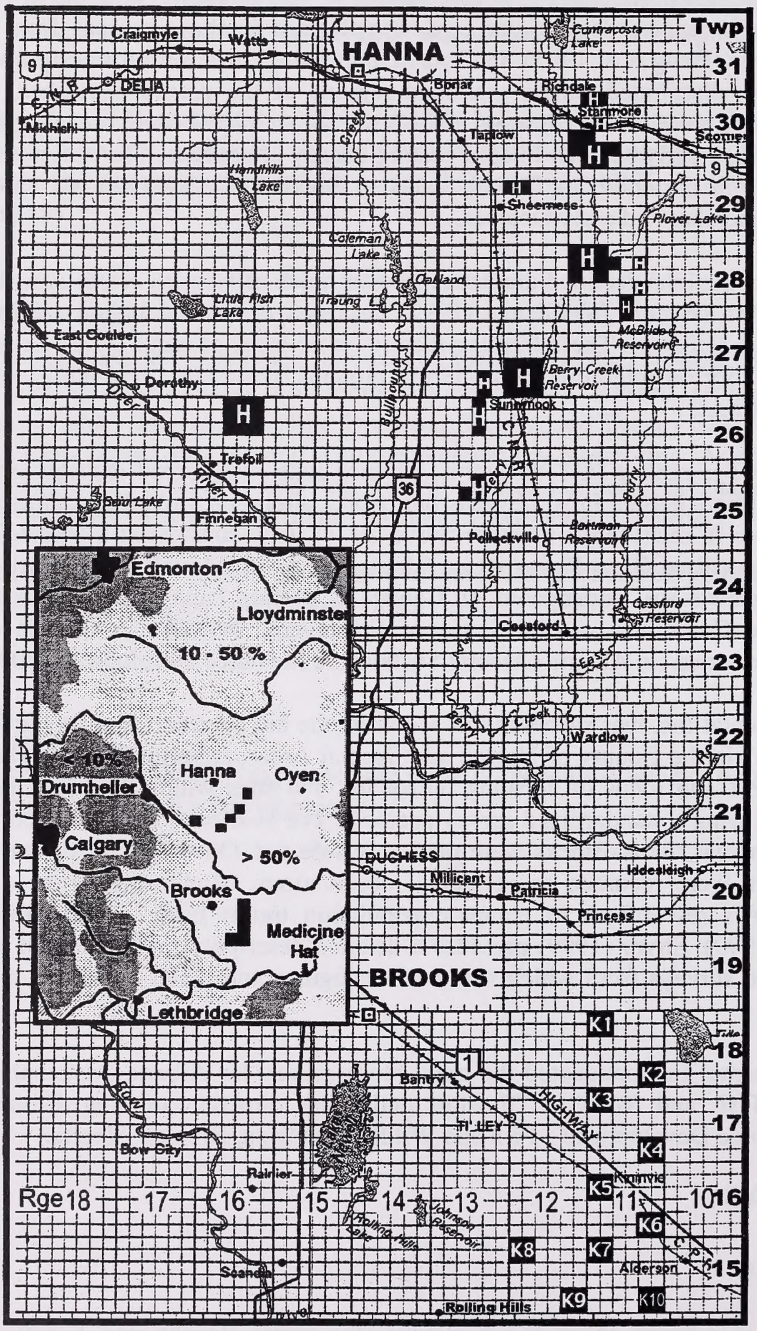


Figure 1. Location of trend blocks in Brooks and Hanna. Inset shows survey areas in respect to remaining percentage of native prairie (adapted from Shyry 1999).

HANNA

The study area is referred to as the H-Blocks (See Figure 1) and is comprised of 109-quarter sections in 8 irregularly shaped blocks located in Special Area # 2. The H-Blocks are found north of the village of Pollockville and extends to approximately 16 km east of Hanna. It is bounded to the east by East Berry Creek and to the west by Highway 36 except for block H3 that is located approximately 2 miles west of the village of Homestead Coulee. Habitat within the area is comprised of native and disturbed rangeland fragmented with annual crop cultivation.

The H-Block and K-Block study areas lie within the dry mixed grass ecoregion of southeastern Alberta and the climate is characterized by hot, dry summers and cold winters (Strong 1992). The median annual precipitation in the region is 272 mm (Strong 1992). Native rangelands are dominated by *Stipa-Bouteloua-Agropyron* vegetation communities (Strong 1992, Coupland 1961).

METHODS

KININVIE AREA

The 10 survey blocks in the County of Newell are comprised of 160 quarter sections. The dates of previous survey can be found in Table 1. Only 128 quarters were surveyed in 1993. The K-blocks are on land owned by the Eastern Irrigation District (EID).

HANNA AREA

The 8 survey blocks in the Special Areas are comprised of 109 quarter sections. The dates of previous survey can be found in Table 1. Only 76 quarters were surveyed in 2000. The H-blocks are on lands occupied by 21 individual landholders.

BURROWING OWL SURVEY PROTOCOL 2001

Each quarter section (0.8 km by 0.8 km) had a GPS location for the center of the quarter. The K-Blocks were designed with 16 quarters per 'block' (3.2 km by 3.2 km) and the H-Blocks are irregularly shaped. A data sheet was used with 4 sections per sheet (16 quarters) (See Appendix).

Two observers were required per quarter. Elevated points were strategically chosen for best visibility roughly 1-200 m from the center. The all terrain vehicle (ATV) was shut down, waiting 5 minutes to let the effect of disturbance subside, while making a 360° pan of the quarter with aid of binoculars or spotting scope. The taped primary call was played for 5 minutes while scanning the area during the call. The caller was placed above the cargo box and the speaker rotated equally in each direction. Any nests/roosts or possible sightings were investigated before going on to the next quarter. Any 'out of block' burrowing owl sightings were also investigated and recorded.

Surveys were not conducted on rainy days or days with wind speeds greater than approximately 20 km/hr., B-4 on the Beaufort Windscale. Surveys began at approximately 0600 and were usually completed by 1430.

When no young were seen, the minimum requirement for determining if a burrow was a nest included: the presence of nest material (dung) in the burrow entrance, the presence of prey, pellets or prey parts, loose soil across the breadth of the burrow floor, feathers and whitewash. All pertinent owl evidence was recorded and an explanation given on the datasheet. If owls were detected after the 10-min. observation period, they were recorded with a clear note to explain where they were, how they were found and why they were missed. Adherence to the established protocol conducted by experienced observers ensures that bias is minimized between observers and different years.

Navigation and georeferenced locations were recorded in the North American Datum 83 Universal Transverse Mercator format and achieved with Garmin™ 12 and 12XL Global Position System units. A permanent marker pin was placed 1 m away from the head of the burrow (area opposite the mound).

To maximize the amount of information obtained, additional data was recorded on plots including landuse, human occupation, and % visibility. The following other species were also recorded on a presence/absence basis: ferruginous hawk, Swainson's hawk, short-eared owl, Baird's sparrow, upland sandpiper, loggerhead shrike, long-billed curlew and any other uncommon fauna. Burrowing owl feathers were also collected at nest sites as part of a stable isotope project being conducted at the University of Alberta.

Two – 800 m Richardson's ground squirrel transects were conducted per block recording used and all burrows either side of the ATV up to 1 meter away resulting in 3200m^2 surveyed.

PRODUCTIVITY MONITORING

Monitoring began one week after the first owlets were observed at a number of control nest sites within the EID.

The protocol involved the observer positioning himself at a distance so as not to influence the owls' behaviour or at a distance equal to the nearest existing above ground disturbance (e.g., road, wellsite, etc.) The observer then counted the total number of young observed, with the aid of binoculars or a spotting scope, during continual observation for a 30 minute monitoring period.

Monitoring was undertaken during times of peak owl activity that occurs in early morning and early evening. Optimal monitoring times were 3 hours beginning one-half hour before sunrise and a 3 hour period ending one-half hour after sunset.

Monitoring was conducted with three visits on different days and the maximum number of owlets observed at a visit was used to determine productivity at the nest.

RESULTS

The K- Block survey commenced on June 18 and was completed on June 22 (See Table 1). The H-Block surveys began on June 26 and were completed on June 27. All 160 quarter sections were completed in the K-Blocks but due to refusal of entry by landholders, only 34 of the 109 H-Block quarter sections were completed (See Table 2).

No burrowing owls were found in the H-Blocks but 8 nest sites found in the K-Blocks are detailed in Table 3 and the number of nests per 100 km2 are found in Figure 2.
Table 4 provides a summary of nests found in the Brooks and Hanna areas from 1991-2001.

Figure 3 provides a linear regression of the Brooks K-Blocks. The average number of juvenile owls that were observed per successful nest site is presented in Figure 4. Table 6 supports Figure 4 and details the years in which surveys were not conducted.

Productivity monitoring was undertaken from July 10 – 24, 2001 and is detailed in Table 5.

DISCUSSION

Two crews, with no loss to weather days, completed the K-Block surveys in 5 days. The 34 ¼ sections in the Hanna blocks were completed in 2 days.

The reluctance of landholders in the Hanna area to allow the surveys, mainly in response to the proposed federal Species At Risk Act, once again highlights the need for improved communication with government representative(s). The information for Hanna in Figure 2 (1999-2001) and a linear regression are not included, as there was no survey in 1999 and a complete survey was not done in 2000 and 2001. For this information to be included, the data would have to be reworked based on the minimum number of ¼ sections searched (34 in 2001) and would not accurately reflect the efforts undertaken.

Efforts are underway to standardize passive productivity monitoring based on the protocol presented in this report (D. Shyry pers. comm.). The number of juvenile owls per successful nest in 2001 is slightly lower than the 2000 results but slightly higher than those reported from the south-eastern area of the EID (5.1/successful nest) (D. Shyry pers. comm.). Nest success in the K-Blocks is slightly lower (75%, n=8) compared to Shyry's (85%, n=20) The number of nests in the K-Blocks is down slightly, however the linear regression is showing a slightly positive trend.

MANANGEMENT IMPLICATIONS AND FUTURE DIRECTIONS

The need to keep landholders informed on both Federal and Provincial Government initiatives involving species at risk is paramount if managers are to be successful in their efforts. A close working relationship exists between ASRD and the EID in the Brooks area but unfortunately there are no local personnel available to nurture such relationships in the Hanna area. The continuation of these surveys will only be successful if landholders concerns are alleviated.

The trend block surveys provide the only rigorous index of how burrowing owls are surviving in Alberta. These surveys should be continued in 2002.

Table 1. Dates of trend block surveys.

Year	Hanna	Brooks
1991	July 5 – July 23	No Survey
1993	July 8 – July 23	June 21 - July 20
1994	July 8 – July 15	June 21 - June28
1995	No Survey	June 19 - July 28
1997	July 14 – July 24	June 7 - June 27
1998	July 2 – July 11	June 17 - June25
1999	Not Surveyed	June 14 – June 19
2000	June12 – June 21	June 12 – June 21
2001	June 26 – June 27	June 18 – June 22

Table 2. Land surveyed in H-Blocks in 2001.

H block	Areas Surveyed	Total
H3	All 35, NW26, SW26, SE26, SW25, NW36, SW36, SE34, NE27, SE27,	14
H6	NW9, NE9, SE9, NE11, SE11, NE2, SE2	7
H7	NW29, SW29, SE29, SE28, SW28	5
H8	SW21, NW4, ALL 5, NW9, SW9	8
	TOTAL QUARTERS SURVEYED	34
	TOTAL QUARTERS H-BLOCK	109
	TOTAL QUARTERS NOT SURVEYED	75

Figure 2. Nests per 100 km^2

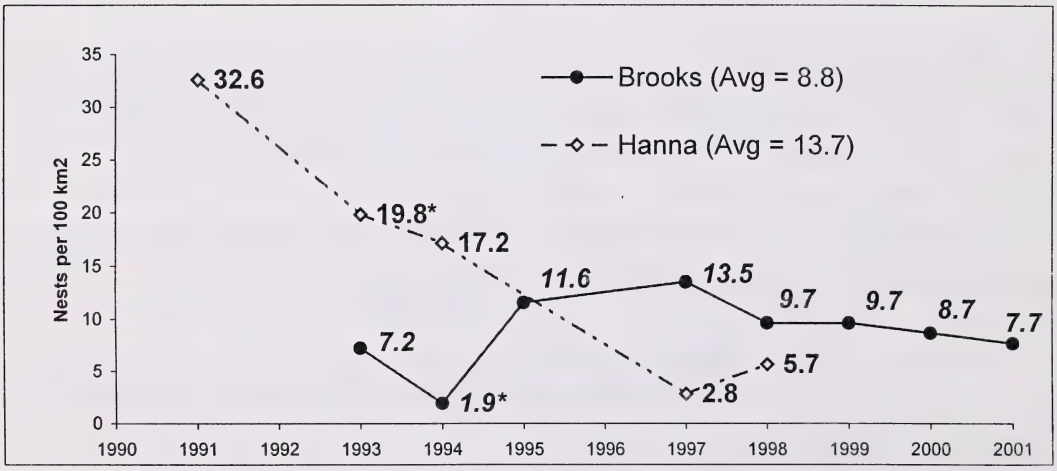


Table 3. Results of K-block burrowing owl 2001 trend block survey.

WPT	DATE	K -BLK	TOTAL	BURROW
			# OWLS	NUMBER
BO200101	18-Jun	3	2	BWC 073
BO200102	18-Jun	3	2	BWC 087
BO200103	19-Jun	6	2	#064
BO200104	20-Jun	8	1	Single
BO200105	21-Jun	9	2	BWC 078
BO200106	19-Jun	2	2	614-27393
BO200107	19-Jun	2	2	614-27395
BO200108	19-Jun	2	2	614-27394
BO200109	21-Jun	5	1	Single
BO200110	21-Jun	5	2	614-27398
off 10	19-Jun	6S	1	#10
off 16	20-Jun	8S	2	#16
TOTAL OWLS OBSERVED			21	
TOTAL OWLS IN BLOCK			18	
TOTAL OWLS OFF BLOCK			3	
TOTAL LOCATIONS			12	
LOCATIONS INSIDE K BLOCKS			10	
LOCATIONS OUTSIDE BLOCK			2	

Note: UTM to Legal conversions calculated at http://www.ags.gov.ab.ca/TOOLS/AGS_TOOLS.HTP

Table 4. Number of nests observed during surveys.

	1991	1993	1994	1995	1997	1998	1999	2000	2001
Brooks		6	2*	12	14	10	10	9	8
Hanna	23	14*	9		2	4		2*	0*

*Not complete survey (less area surveyed).

Figure 3. Brooks K-block trend (linear regression).

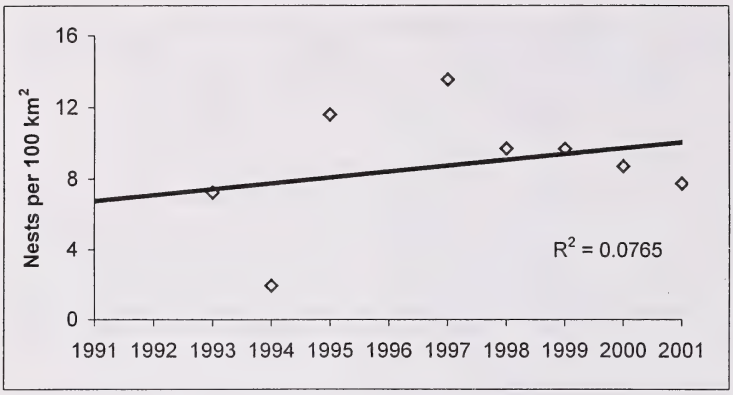
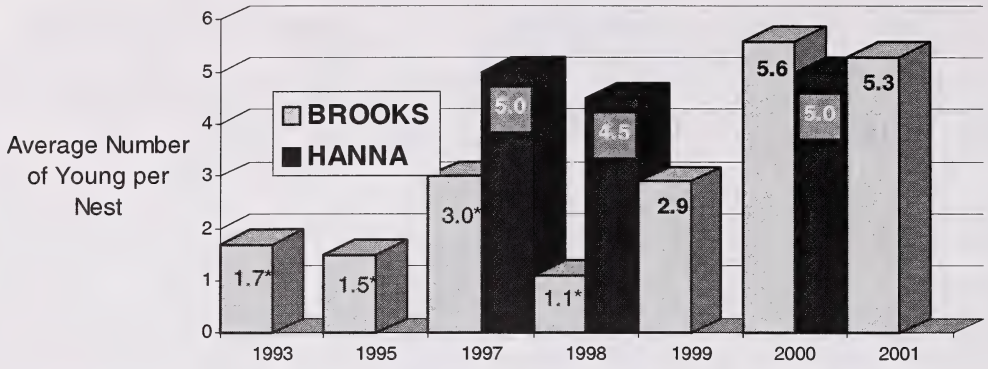


Table 5. Productivity results from K-Block burrowing owl nest sites/attempts found during the 2001 trend block surveys.

WPT	DATE	K -BLK	TOTAL	BURROW	PRODUCTIVITY SEARCH					
			# OWLS	NUMBER	VISITS			MAXIMUM		STATUS
					DATES	Adults	YOY	Adults	YOY	
BO200101	18-Jun	3	**2**	BWC 073	10-Jul	1M	**0**	2	0	Failed
					23-Jul	0	0			
					24-Jul	0	0			
BO200102	18-Jun	3	**2**	BWC 087	10-Jul	1F	0	2	3	Nest
					23-Jul	1	**3**			
					24-Jul	0	0			
BO200103	19-Jun	6	**2**	#064	10-Jul	1F	2	2	6	Nest
					15-Jul	2	4			
					19-Jul	2	**6**			
BO200104	20-Jun	8	**1**	Female	10-Jul	0	0	1	0	Single
					16-Jul	0	0			
BO200105	21-Jun	9	**2**	BWC 078	10-Jul	0	**0**	2	0	Failed
					15-Jul	0	0			
					16-Jul	0	0			
BO200106	19-Jun	2	**2**	614-27393	10-Jul	2	3	2	5	Nest
					14-Jul	1	**5**			
					19-Jul	1	5			
BO200107	19-Jun	2	**2**	614-27395	10-Jul	1F	**5**	2	5	Nest
					14-Jul	2	3			
					19-Jul	1	3			
BO200108	19-Jun	2	**2**	614-27394	10-Jul	1F	3	2	6	Nest
					14-Jul	2	**6**			
					19-Jul	1	4			
BO200109	21-Jun	5	**1**	Male	10-Jul	0	**0**	1	0	Single
					16-Jul	0	0			
BO200110	21-Jun	5	**2**	614-27398	10-Jul	1M	4	2	7	Nest
					14-Jul	2	**7**			
					17-Jul	2	7			
						Total		18	32	
			Average # of juveniles observed/successful nest						5.33	
					Total # Nests					6
					Total # Failed					2
					Total # Singles					2
Note: Bold indicates maximum # of owls observed										

Figure 4. Average number of juvenile owls observed per successful nest site.



*Incidental Observations

Table 6. Average number of juvenile owls observed per successful nest site.

	1993	1995	1997	1998	1999	2000	2001
BROOKS	1.7	1.5	3	1.1	2.9	5.6	5.3
HANNA	N/S	N/S	5	4.5	N/S	5	N/S

N/S = Not Surveyed

LITERATURE CITED

Alberta Sustainable Resource Development. 2001. The general status of Alberta wild species 2000. Fish and Wildlife Service, Edmonton, Alberta, Canada. 46 pp.

Alberta Wildlife Management Division. 1996. The status of Alberta wildlife. Alberta Natural Resources Service. Edmonton, Alberta. 44 pp.

COSEWIC. 2001. Canadian Species at Risk, May, 2001. Committee on the Status of Endangered Widlife in Canada, Ottawa, Ontario, Canada. 31 pp.

Coupland, R. T. 1961. A reconsideration of grassland classification in the northern great plains of North America. Journal of Ecology 49: 135-167.

Haug, E.A. 1985. Observations on the breeding ecology of Burrowing Owls in Saskatchewan. M.Sc. thesis, Univ. of Saskatchewan, Saskatoon.

Haug, E.A., B.A. Millsap, and M.S. Martell. 1993. Burrowing Owl (*Speotyto cunicularia*). In: The Birds of North America, No. 61 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

James, P. C. 1992. Where do Canadian Burrowing Owls spend the winter. Blue Jay 50: 93-95.

Kjearsgaard, A. A. and W. W. Pettapiece. 1986. Soils of the Medicine Hat area (72L/SE and 72L/SW). Agriculture Canada, Research Branch, Land Resource Research Centre, Edmonton, Alberta. Map scale 1:126,720. LRRC contribution no. 90-24.

Martell, M. S. 1991. Grassland owls. Nat. Wildl. Fed. Sci. Tech. Ser. 15:96-104.

Marti, C. D. and J. S. Marks. 1989. Medium sized owls. Natl. Wildl. Fed. Sci. Tech. Ser. 12:124-133.

NatureServe: An online encyclopedia of life [web application]. 2001. Version 1.5 . Arlington, Virginia, USA: Association for Biodiversity Information. Available: http://www.natureserve.org/. (Accessed: October 9, 2001).

Schmutz. J.K. 1994. A census of breeding burrowing owls in southern Alberta: 1994. Prepared for Alberta Environmental Protection, Natural Resource Service, Wildlife Management Division, Nongame Unit. Edmonton. 15 pp. + appendices.

Shyry, D. T. 1999. A summary report on Burrowing Owl (Athene cunicularia) population trend surveys in southern Alberta: 1991-1998. Alberta Environment, Wildlife Management Division, Occasional Paper, Alberta Natural Resources Service, Edmonton, AB. 16 pp.

Strong Ecological Land Survey Ltd. 1992. Ecoregions and ecodistricts of Alberta Volume 1. Alberta Forestry, Lands and Wildlife, Edmonton, Alberta. 77 pp.

Wedgewood, J. A. 1978. The status of the Burrowing Owl in Canada. A report prepared for the Committee on the Status of Endangered Wildlife in Canada. Canadian Wildlife Service, Ottawa, Ontario. 84 pp.

Zarn, M. 1974. Burrowing Owl. Rept. No. 11. Habitat management series for unique or endangered species. Bureau of Land Management, Denver, CO. 25 pp.

APPENDIX

Sample H-Block Trend Block Data Sheet

BURROWING OWL CENSUS - 2001

H-BLOCK _____

Day _____ Time _____ TO _____

Month _____ Nearest town _____

Sections _____ Tp _____ Rg _____ W4 _____ WMU# _____

Wind _____ Weather (circle two) clear partcloud cloud °C 10s 20s 30s

OBSERVER 1 _____ OBSERVER 2 _____

VISIBILITY:(mark % in each quarter section)

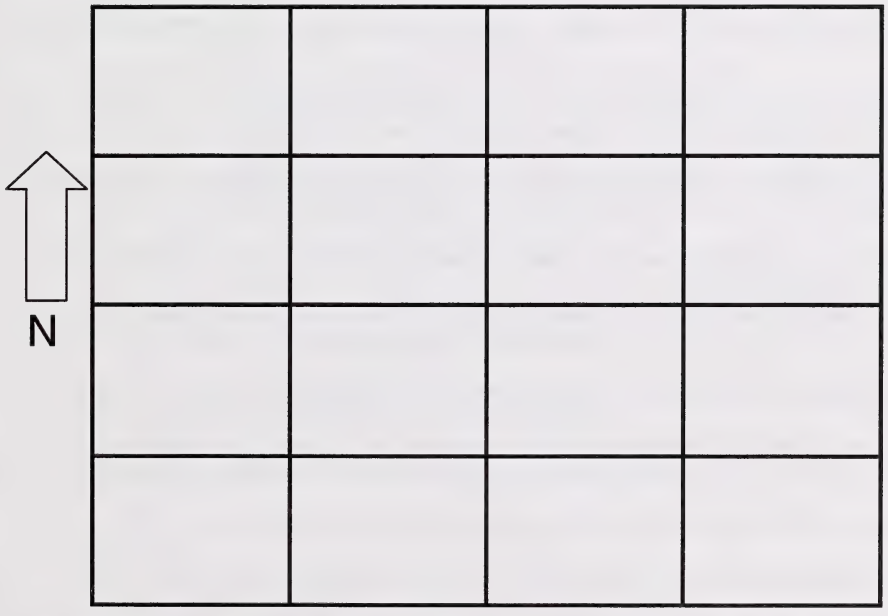
OTHER SPECIES OBSERVED/HEARD:

SWHA	_____			SPPI	_____
FEHA	_____	UPSA	_____	LBCU	_____
SEOW	_____	LOSH	_____	NOHA	_____

GROUND SQUIRREL TRANSECT:(2 X 800 M) (GST----------GST)

USED BURROWS OB1 OB2

ALL BURROWS OB1 OB2



BURROWING OWLS LOCATED AT : 1. EASTING _____ # OFF BLOCK _____

12U NORTHING _____ EASTING _____

2 EASTING _____ NORTHING _____

H-BLOCK # _____ NORTHING _____

PAIRS _____ 3 EASTING _____

SINGLES _____ NORTHING _____

#YOUNG _____ 4 EASTING _____

NORTHING _____

List of Titles in This Series

(as of March 2002)

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